Importance of Habitat Conservation for Wild Bees and other Native Pollinators

Presented by

Photo: Edward S. Ross

Talk Outline

- Importance of pollinators for crops and wildlife
- Research linking natural habitat and crop pollination
- Pollinators in the 2008 Farm Bill
- NRCS practices that support pollinators

Photo: Bruce Newhouse

Importance of Pollinators

Pollinators provide an ecosystem service that enables plants to produce fruits and seeds.

- About 85% of the world's plants require a pollinator
- 35% of crop species, worldwide
- Value of crops in U.S.: $18 to $27 billion
- One in three mouthfuls of food and drink we consume

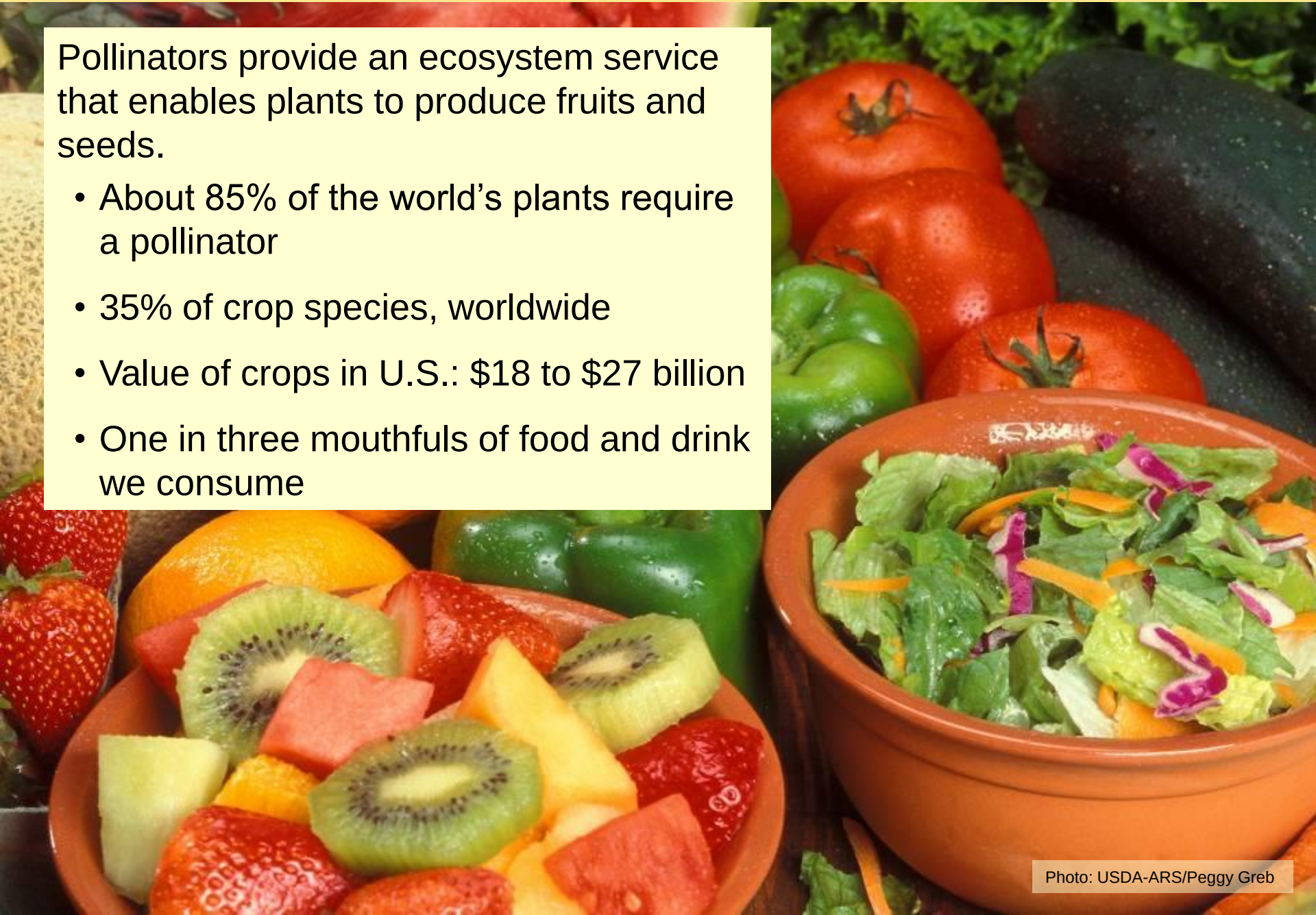


Photo: USDA-ARS/Peggy Greb

Importance of Pollinators

- Fruits and seeds are a major part of the diet of about 25% of birds, and many mammals
- Pollinators and the diverse insects associated with good pollinator habitat are food for wildlife

Main Groups of Pollinators






Photos: Mace Vaughan, Bob Hammond, David Inouye, Bruce Newhouse

Bees: The most important pollinators

- Bees provide for their young
- Bees actively collect and transport pollen
- Bees exhibit flower constancy
- Bees regularly forage in area around nest

Photo: Edward S. Ross

Crop Pollination by Bees

Most crop pollination is done by the European honey bee.

This leaves us reliant on a single pollinator, one that is experiencing many problems.

Photo: USDA-ARS/Scott Bauer

Crop Pollination: Honey Bees in Decline

Fewer honey bees available

- Over 50% decline in number of managed hives since 1950
- 70-100% decline in feral colonies since the 1990s
- 30% losses across the industry over 2006-07 season
- 35% losses across the industry over 2007-08 season

Causes: Disease, pests, honey prices, and Colony Collapse Disorder

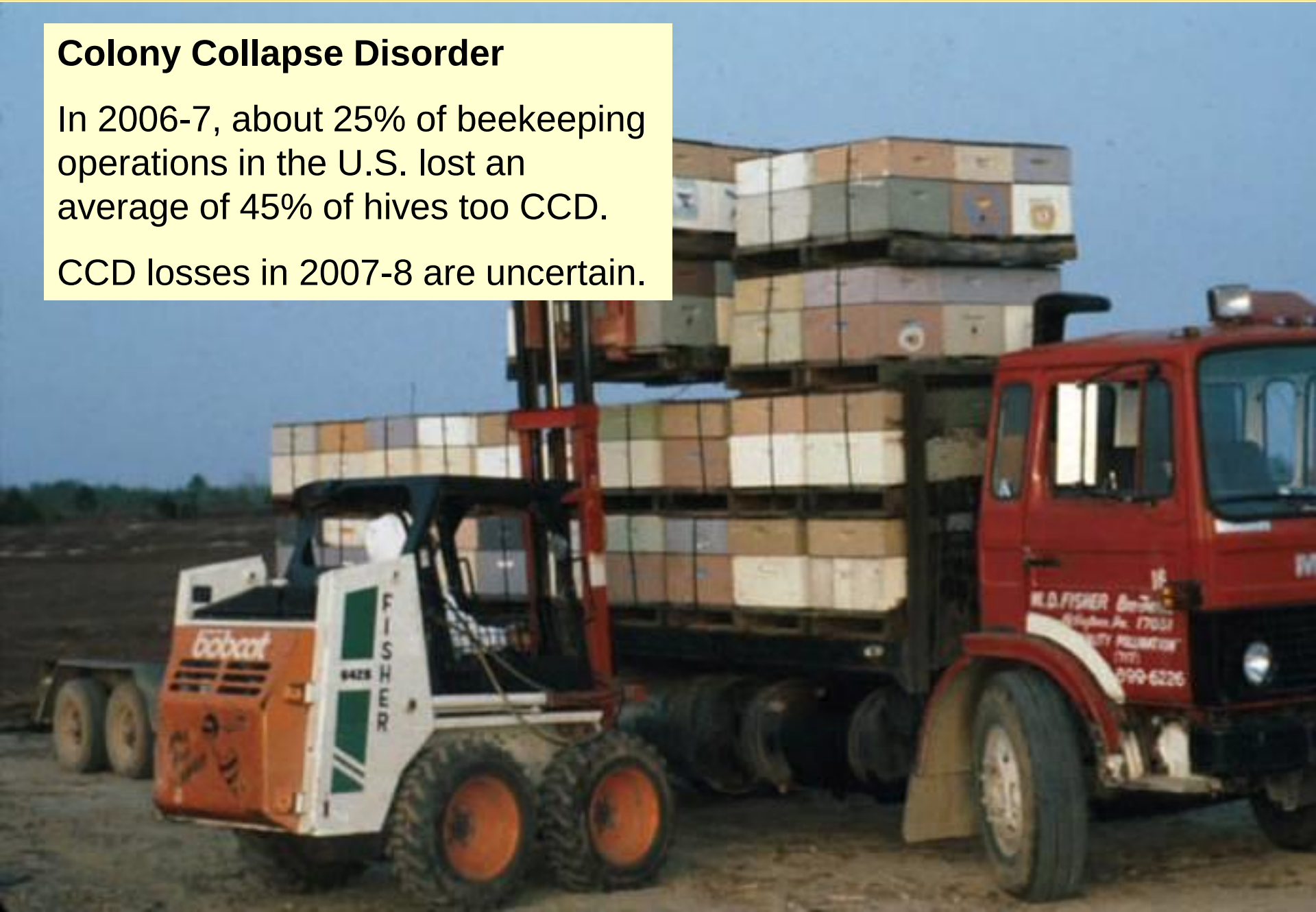
Photo: USDA-ARS/Scott Bauer

Crop Pollination: Honey Bees in Decline

Colony Collapse Disorder

In 2006-7, about 25% of beekeeping operations in the U.S. lost an average of 45% of hives too CCD.

CCD losses in 2007-8 are uncertain.



Crop Pollination: Honey Bees in Decline

Causes of Colony Collapse Disorder still unknown:

- Disease/pathogen?
  - Israeli Acute Paralysis Virus?
  - New strain of *Nosema*?
- Pests?
- Poor diet?
- Insecticides?
- Stress?

- **Not cell phones or Bt Corn**

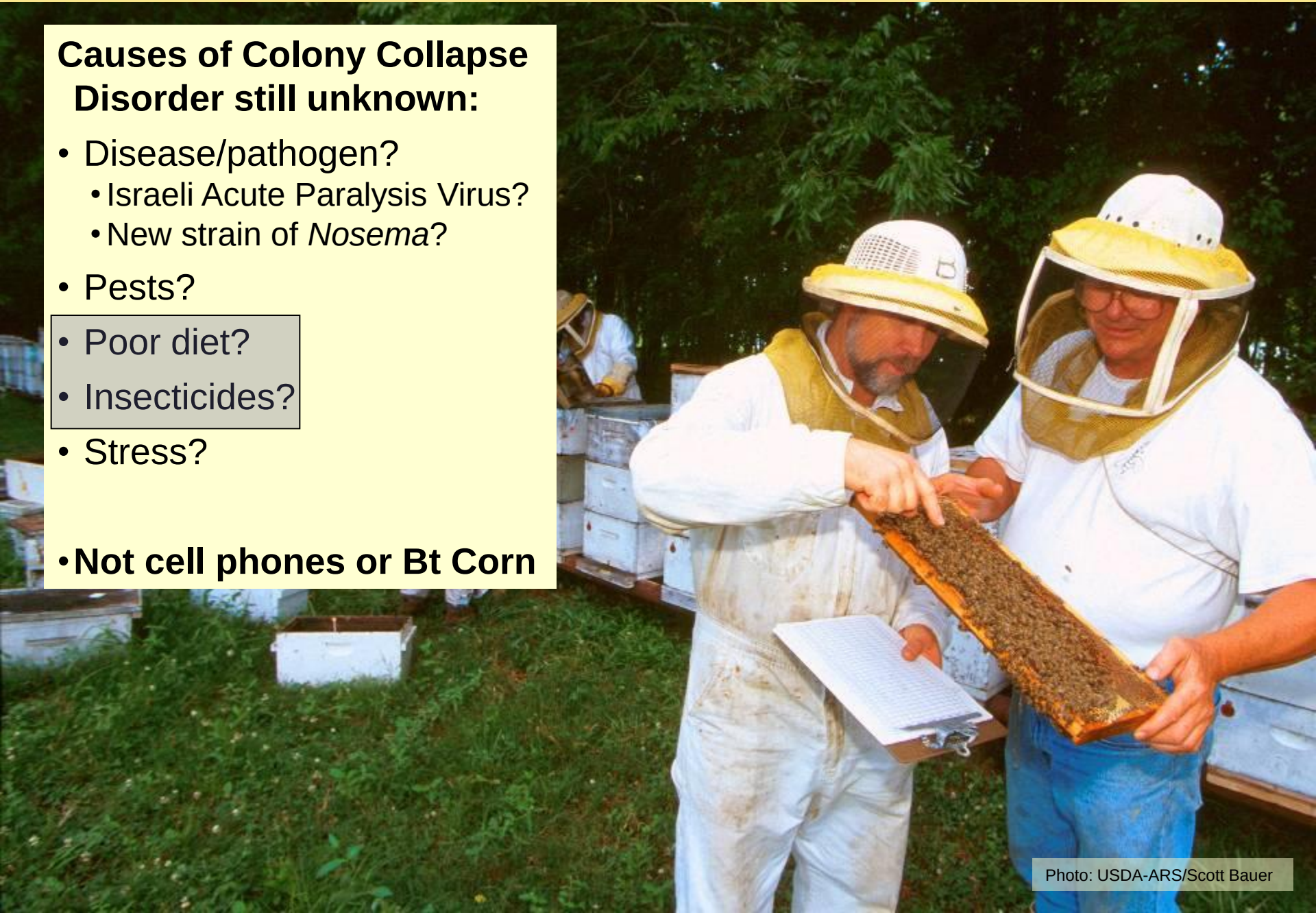


Photo: USDA-ARS/Scott Bauer

Other Important Bees in Decline

Native bees also in decline:

Four sister species of bumble bees

Evans, E.,R. Thorp, S. Jepsen, and S. Hoffman Black, 2009. Status Review of Three Formerly Common Species of Bumble Bee in the Subgenus *Bombus.* Xerces Society.

Cameron et al. 2011. Patterns of widespread decline in North American bumble bees. PNAS.

Colla and Packer. 2008. Evidence for decline in Eastern North American bumble bees (Hymenoptera: Apidae), with special focus on Bombus affinis Cresson. Biodivers Conserv.

Importance of Native Bees

What does all this mean for the sustainability of crop pollination?

Photo: Mace Vaughan, Xerces Society

Crop Pollination: Important to diversify

Fewer honey bees available

- Important to diversify pollinators for production agriculture
- Important to strengthen habitat and pesticide protection for all bees (honey and native)

Photo: Bob Hammond, CSU Coop Ext

Crop Pollination: Native bees

Research demonstrates contribution of native bees to crop pollination:

- 51 species recorded visiting tomato, sunflower, or watermelon in California
- More than 80 bee species recorded visiting berry crops in Massachusetts, Maine, and Nova Scotia

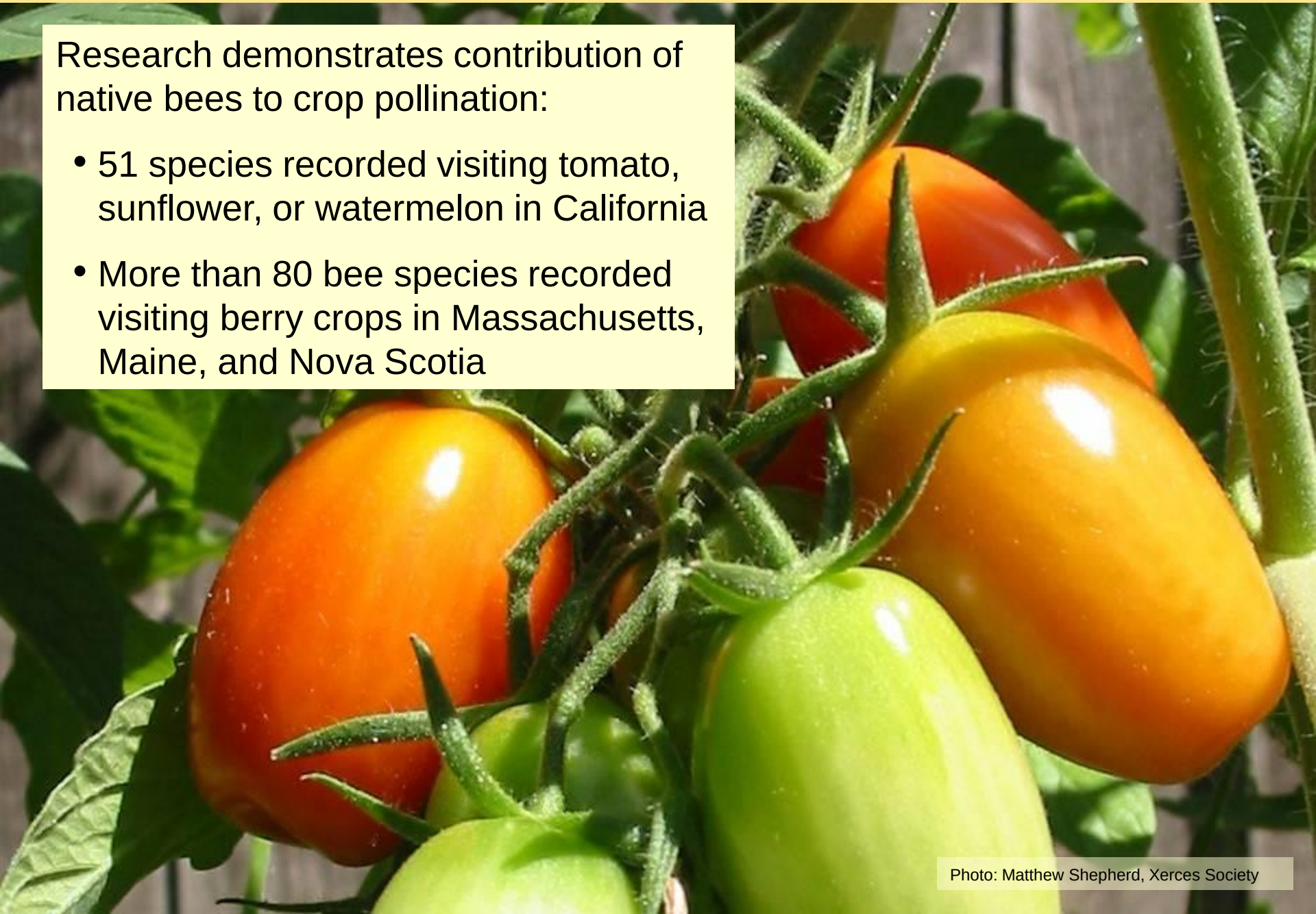


Photo: Matthew Shepherd, Xerces Society

Native Bee Diversity

North America: 4,000+ species

Photo: Edward S. Ross

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FOR INVERTEBRATE CONSERVATION

Native Bee Diversity


Honey bee (*Apis mellifera*)


Polyester bee (Colletes sp)


Bumble bee (*Bombus edwardsii*)


Leafcutter bee (*Megachile* sp.)

Photos: James Cane; Steve Javorek (Ag Canada); Edward S. Ross

Native Bee Diversity


Metallic sweat bee (*Agapostemon* sp.)


Yellow-faced bee (*Hylaeus* sp.)


Mason bee (*Osmia* sp.)


Sweat bee (*Halictus* sp.)

Photos: Bruce Newhouse; Edward S. Ross; Mace Vaughan; USDA-ARS/Jack Dykinga

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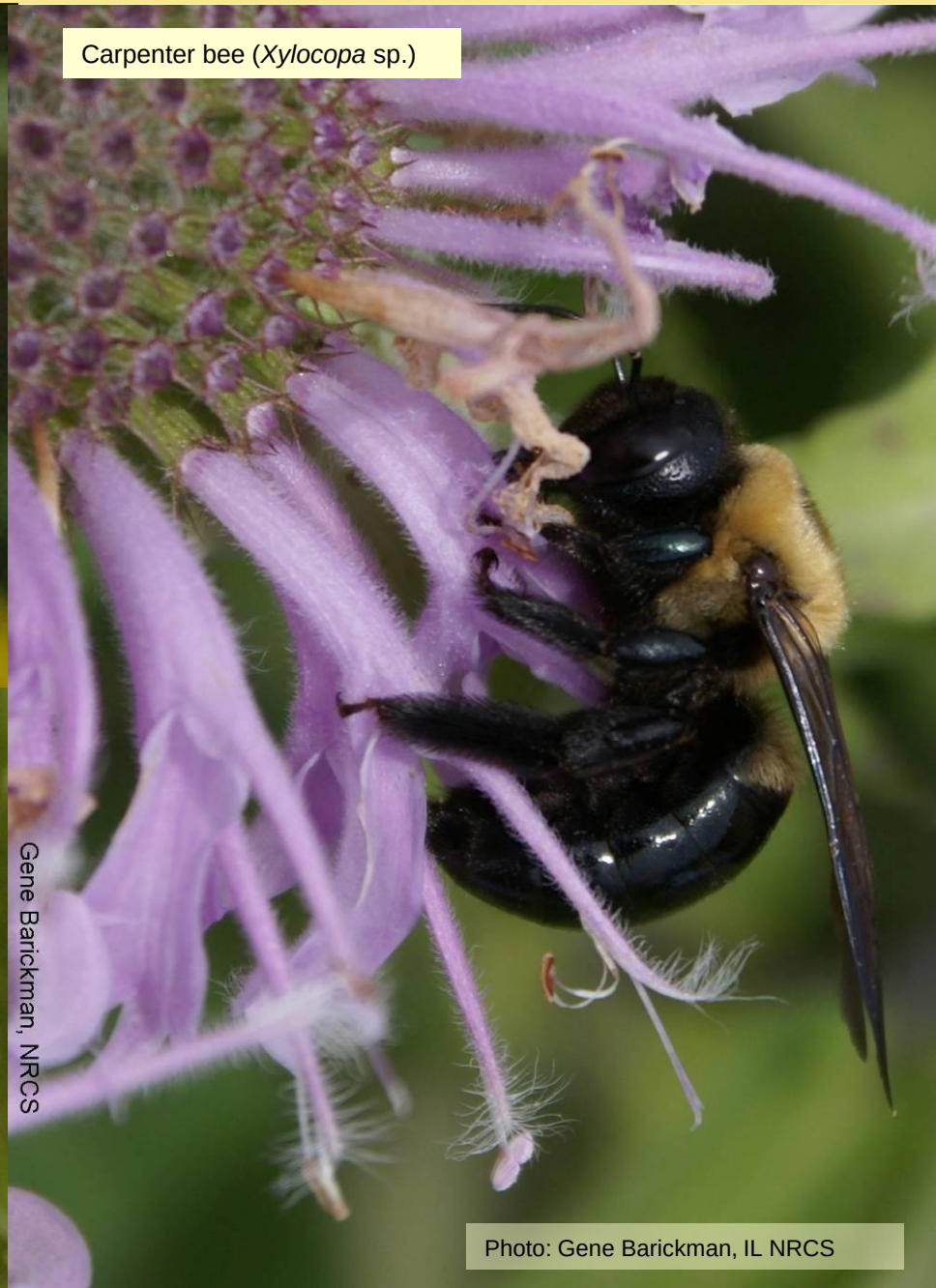
Native Bee Diversity

Sunflower bee (*Svastra* sp.)

Photo: Bob Hammond, CSU Coop Ext

Long-horned bee (*Mellisodes* sp.)

Photo: Bob Hammond, CSU Coop Ext



Carpenter bee (*Xylocopa* sp.)

Gene Barickman, NRCS

Photo: Gene Barickman, IL NRCS

Crop Pollination: Native bees

Native bees are very efficient:

- active earlier and later in the day
- collect both pollen and nectar
- buzz pollination
- keep honey bees moving
- no rental fees

Native bees can supplement honey bees if they are hard to acquire.

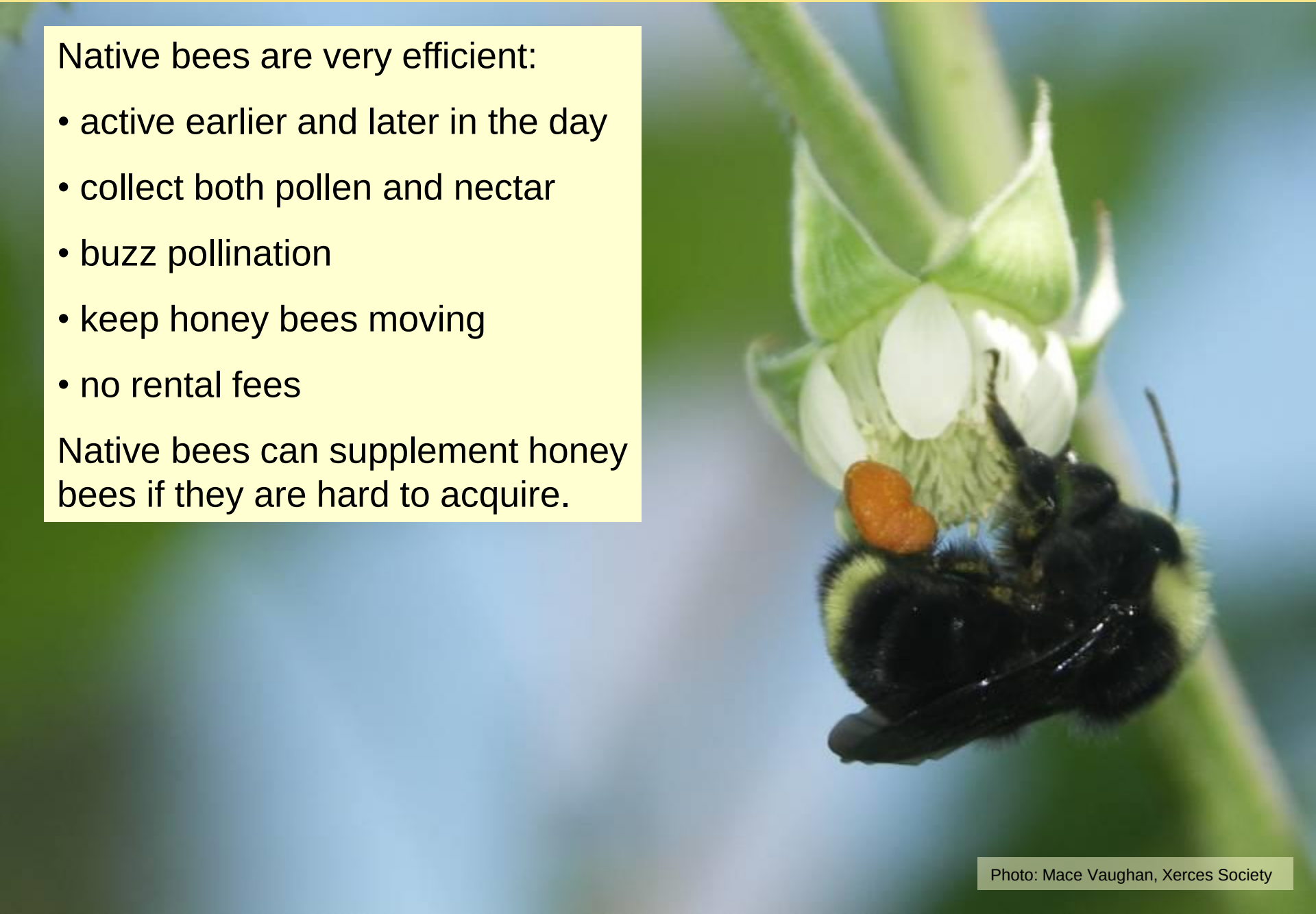


Photo: Mace Vaughan, Xerces Society

Crop Pollination: Native bees

Example: hybrid sunflower seed

When native bees were present, the seed set in hybrid sunflower fields more than doubled.

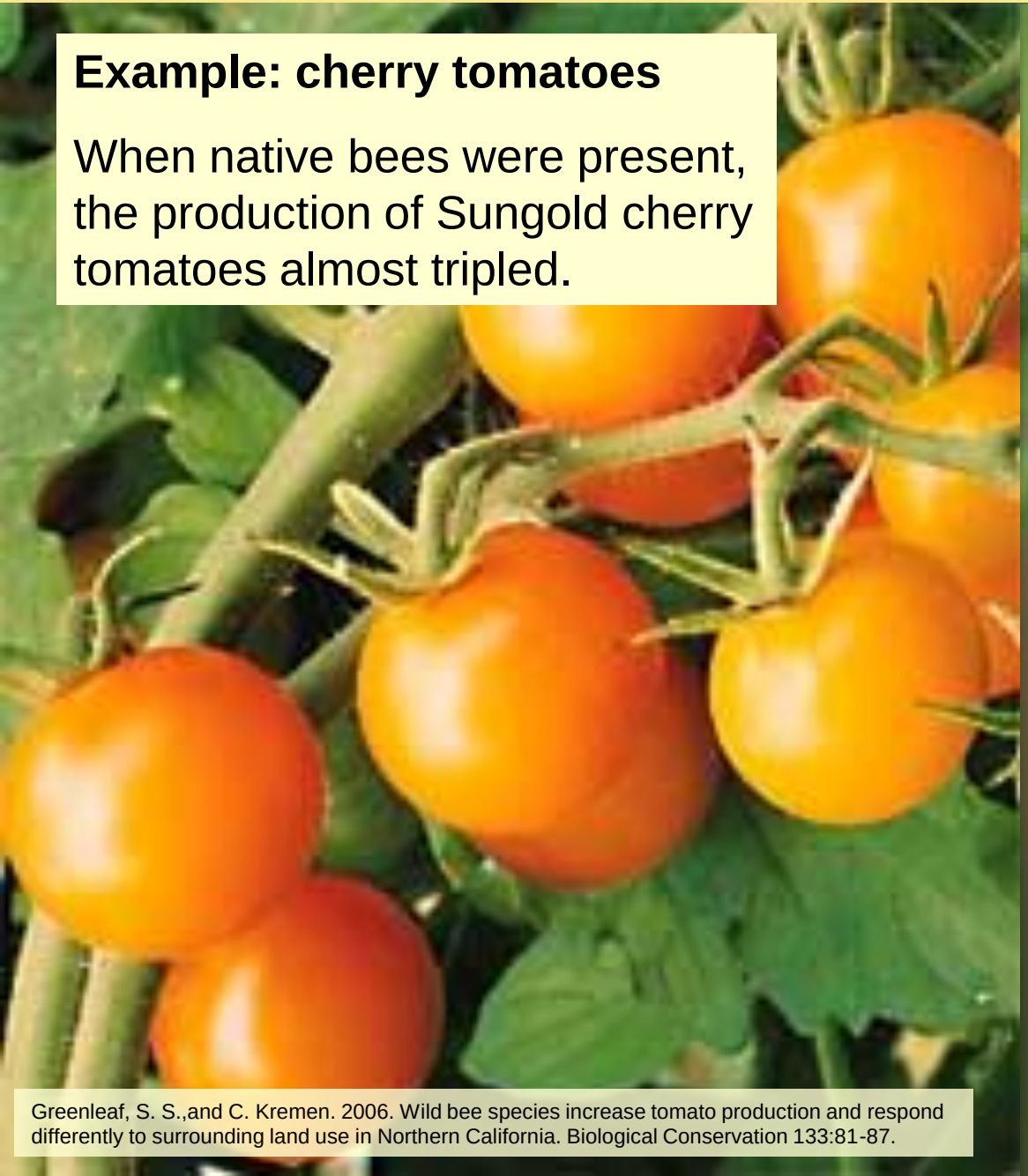
Greenleaf, S. and C. Kremen. 2006. Wild bees enhance honey bees' pollination of hybrid sunflower. Proceedings of the National Academy of Sciences. 103(37):13890–13895.fs

Photos: Sarah Greenleaf

Crop Pollination: Native bees

Example: cherry tomatoes

When native bees were present, the production of Sungold cherry tomatoes almost tripled.

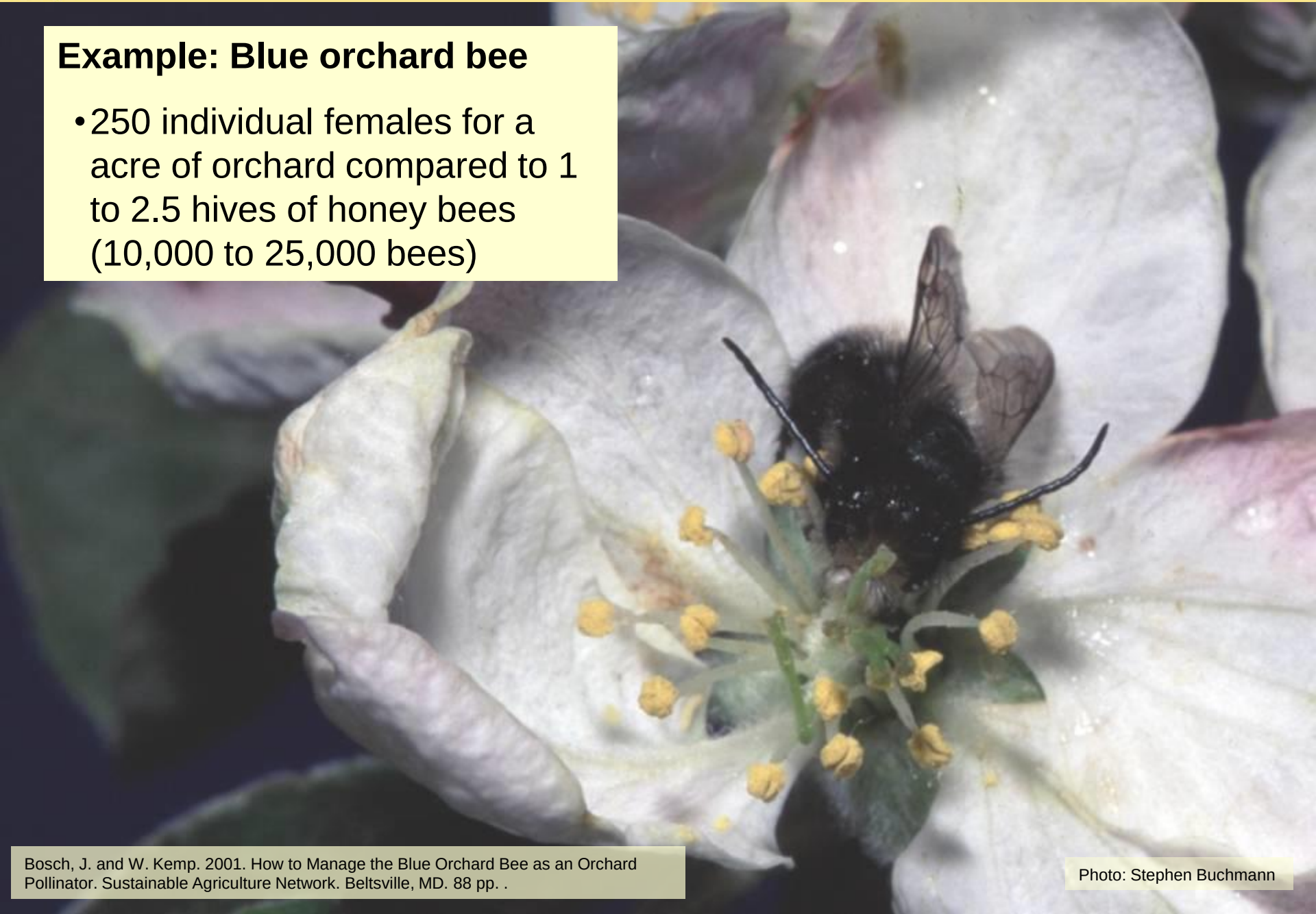


Greenleaf, S. S.,and C. Kremen. 2006. Wild bee species increase tomato production and respond differently to surrounding land use in Northern California. Biological Conservation 133:81-87.

Crop Pollination: Native bees

Example: Blue orchard bee

- 250 individual females for a acre of orchard compared to 1 to 2.5 hives of honey bees (10,000 to 25,000 bees)



Bosch, J. and W. Kemp. 2001. How to Manage the Blue Orchard Bee as an Orchard Pollinator. Sustainable Agriculture Network. Beltsville, MD. 88 pp. .

Photo: Stephen Buchmann

Value of Natural Areas

Pollinators need habitat.

The amount of natural areas on or close to the farm is a major influence on diversity and abundance of bees.

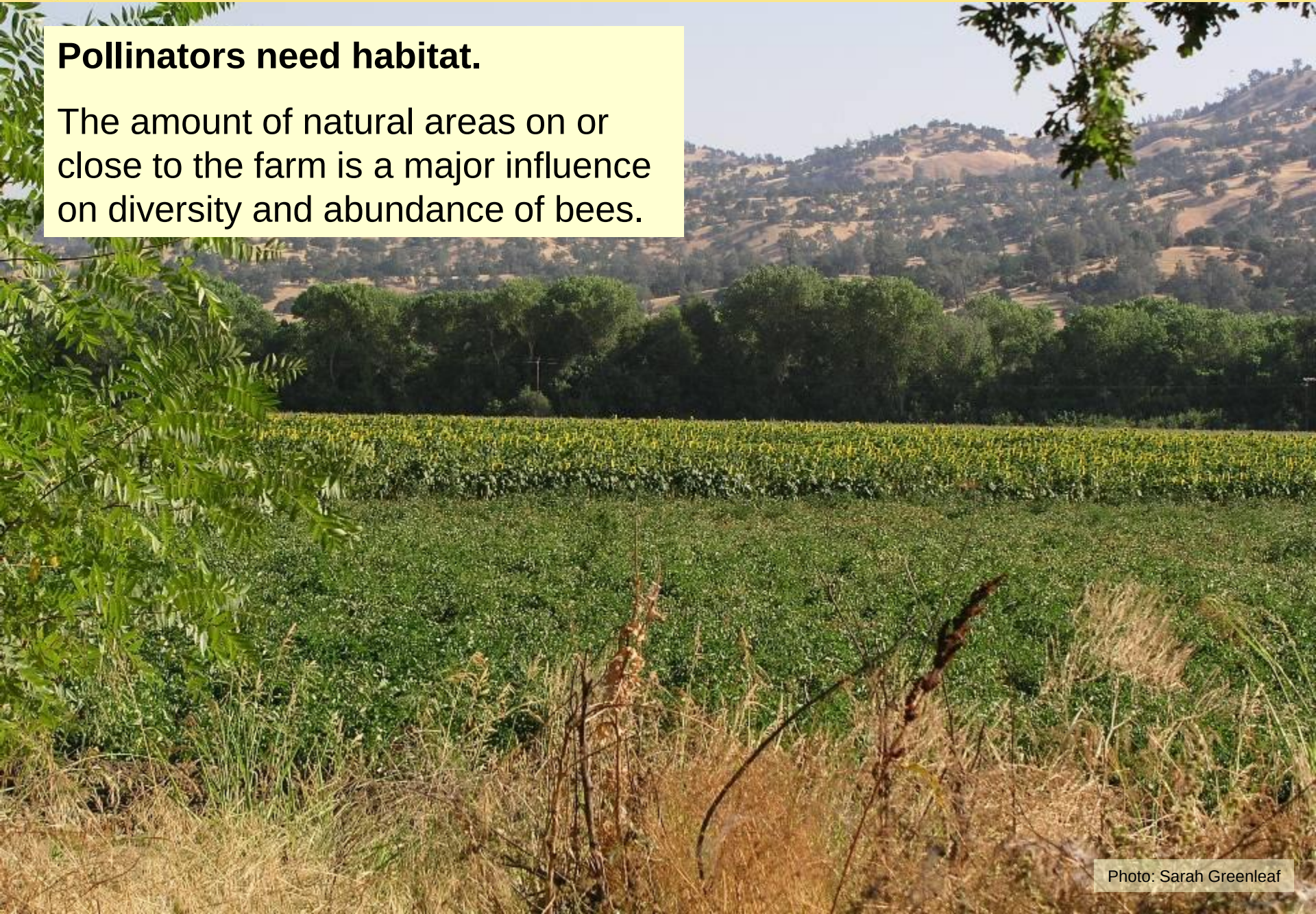


Photo: Sarah Greenleaf

Value of Natural Areas

Example: farms in Mid-Atlantic region

In 90% of farms studied in New Jersey and Pennsylvania, wild native bees provided all pollination needed for watermelon.

Winfree, R. et al.. 2008. Wild bee pollinators provide the majority of crop visitation across land-use gradients in New Jersey and Pennsylvania, USA. Journal of Applied Ecology 45:793-802.

Photo: Rachael Winfree

Value of Natural Areas

Example: watermelon in California

If more than 30% of the area within 1.2 km of a field is natural habitat, growers can achieve full pollination of watermelons by native bees in the Central Valley.

Kremen, C. et al. 2004. The area requirements of an ecosystem service: crop pollination by native bee communities in California. Ecology Letters 7:1109-1119.

Photo: Mace Vaughan

Value of Natural Areas

Example: canola in Canada

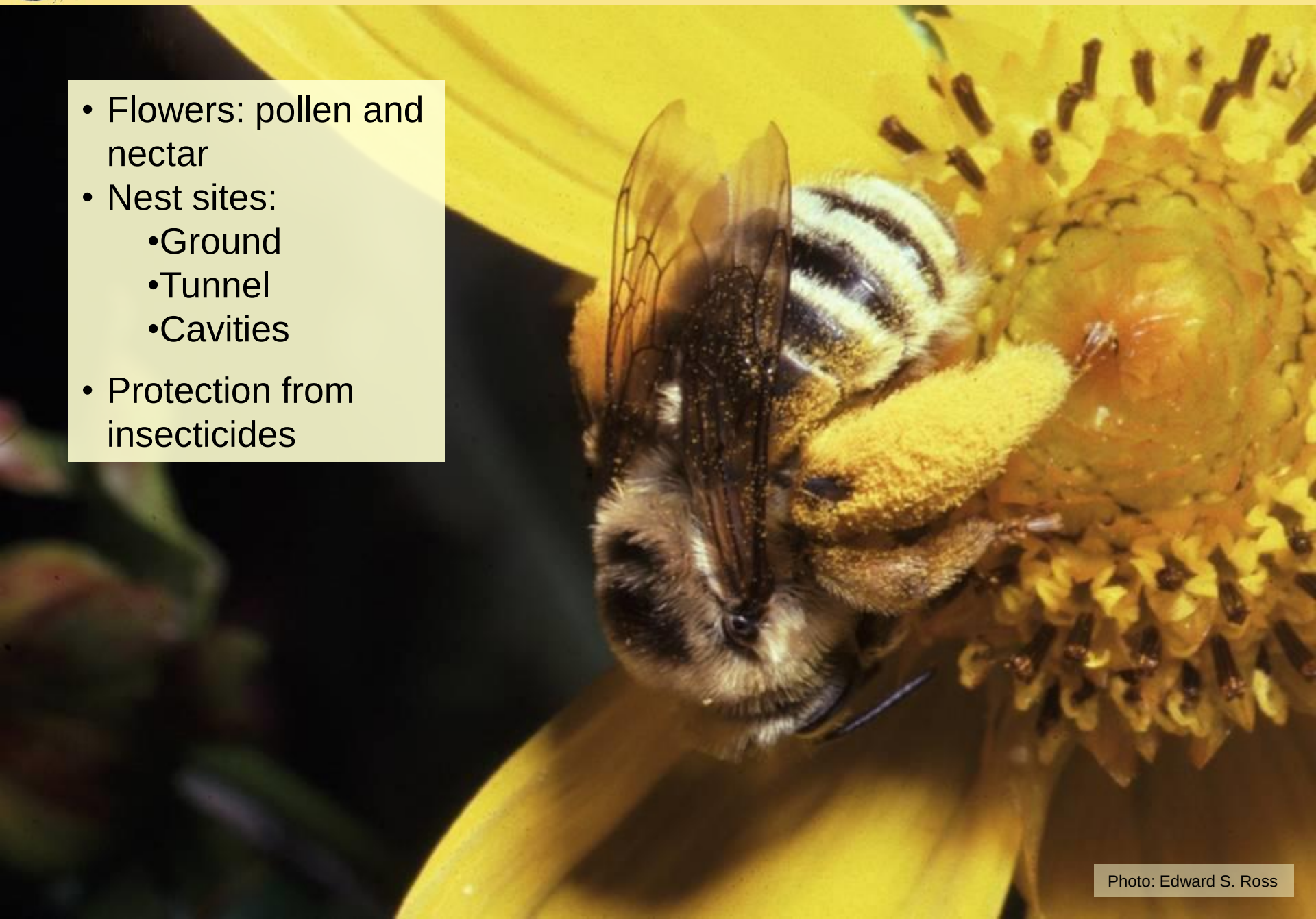
In the absence of honey bees, canola growers make more money on their land if 30% is in natural habitat, rather than planting it all.

Morandin, L., and M. Winston. 2006. Pollinators provide economic incentive to preserve natural land in agroecosystems. Agriculture, Ecosystems and Environment 116:289-292.

Photo: Mace Vaughan

Pollinator Conservation and the NRCS

Pollinator Habitat Needs



- Flowers: pollen and nectar
- Nest sites:
  - Ground
  - Tunnel
  - Cavities
- Protection from insecticides

Photo: Edward S. Ross

Pollinator Habitat Needs: Forage

Photos: Elaine Haug NRCS, Matthew Shepherd; Mace Vaughan, Eric Mader, Jeff McMillan NRCS, Berry Botanic Garden

Pollinator Habitat Needs: Forage

Select plants that provide forage to support bees before and after crop bloom.

Example: flight periods of native bees in relation to blueberry bloom.

TAXA	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT
Colletes (inaequalis, validis)							
Andrena							
Agochlora pura							
Agochlorella striata							
***Halictus* (females)**							
***Lasioglossum* (females)**							
Osmia							
Bombus							

Pollinator Habitat Needs: Tunnels for nests

Retain or create tunnels

- Protect snags wherever possible
- Provide artificial nests

Photos: Mace Vaughan; Katharina Ullman

Pollinator Habitat Needs: Bare soil for nests

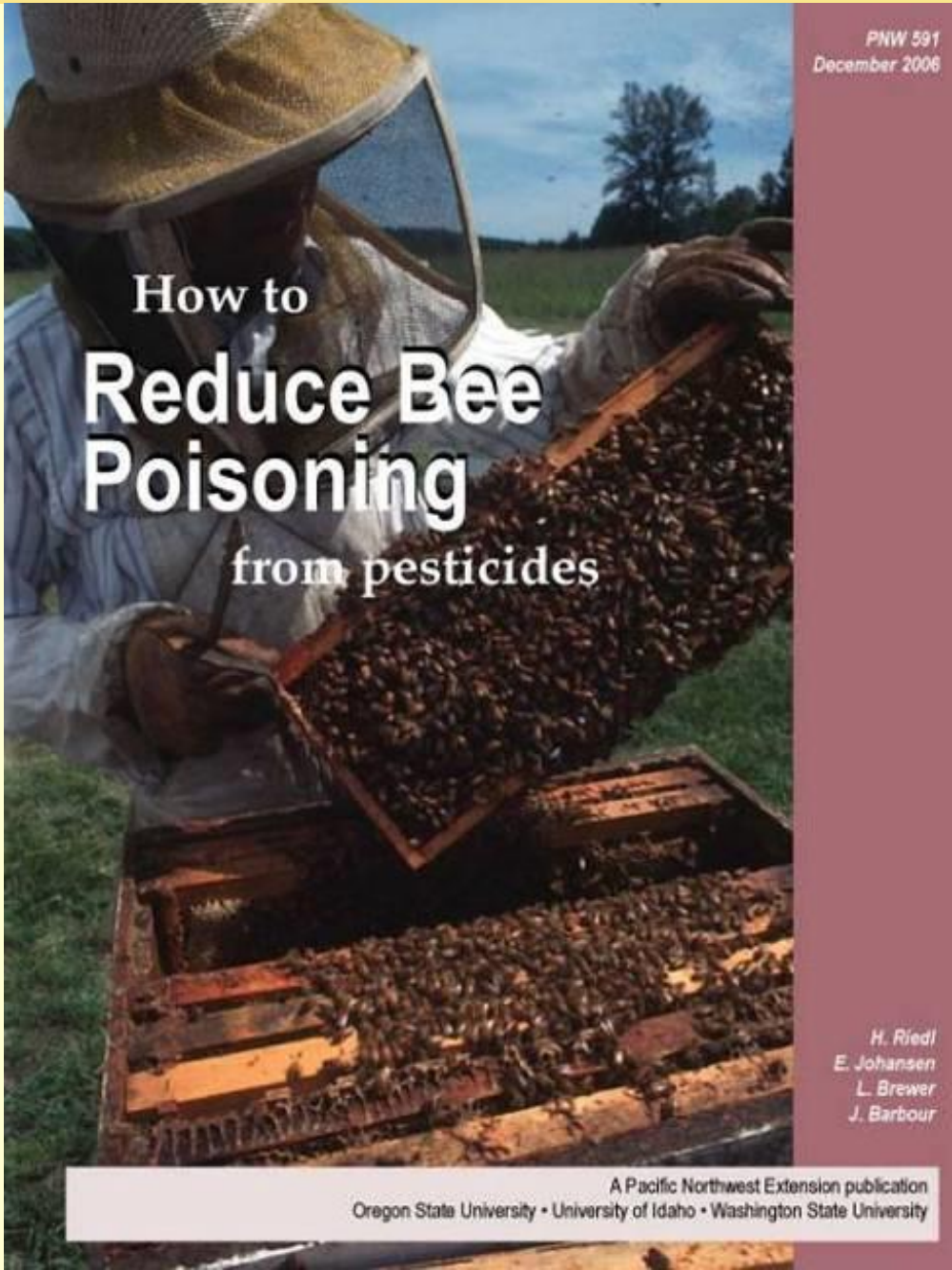
Ground nesting native bees need access to the soil

Photos: Mace Vaughan, Matthew Shepherd

Protecting pollinators from pesticides

Pesticides cause significant damage to pollinator insect populations. NRCS Pest Management Practice (595) can help growers develop IPM practices that:

- Use crop scouting that promotes most targeted application and minimal active ingredients
- Use active ingredients with least impact on bees and other beneficial insects
- Consider alternatives:
  - Pheromone traps and baits
  - Pest-resistant crops



The New Farm Bill

Administrative Requirements for Conservation Programs (P. 161)

(h) ENCOURAGEMENT OF POLLINATOR HABITAT DEVELOPMENT AND PROTECTION.—In carrying out any conservation program administered by the Secretary, the Secretary may, as appropriate, encourage—

(1) the development of habitat for native and managed pollinators; and

(2) the use of conservation practices that benefit native and managed pollinators.

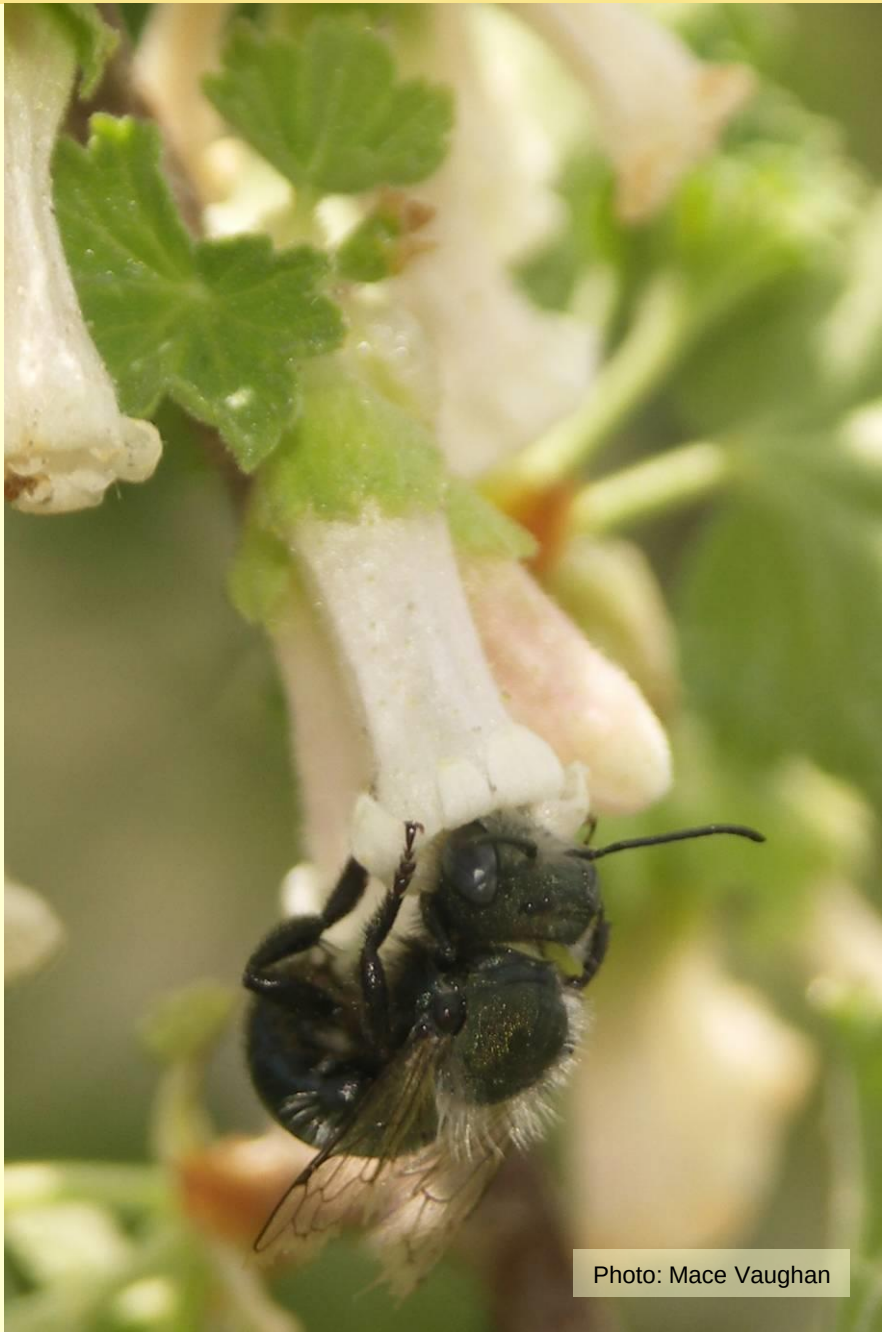


Photo: Mace Vaughan

The New Farm Bill

Environmental Quality Incentives Program (EQIP) (p. 140)

(3) In determining the amount and rate of payments under paragraph (2)(B), the Secretary may accord great significance to a practice that, as determined by the Secretary, promotes—

(A) residue management;

(B) nutrient management;

(C) air quality management;

(D) invasive species management;

(E) ***pollinator habitat****;*

(F) animal carcass management…

Tools Available to Support Growers

Farm Bill conservation programs

- EQIP, WHIP, CSP, GRP, WRP, CRP, CREP, etc.

Many NRCS conservation practices can include habitat for pollinators.

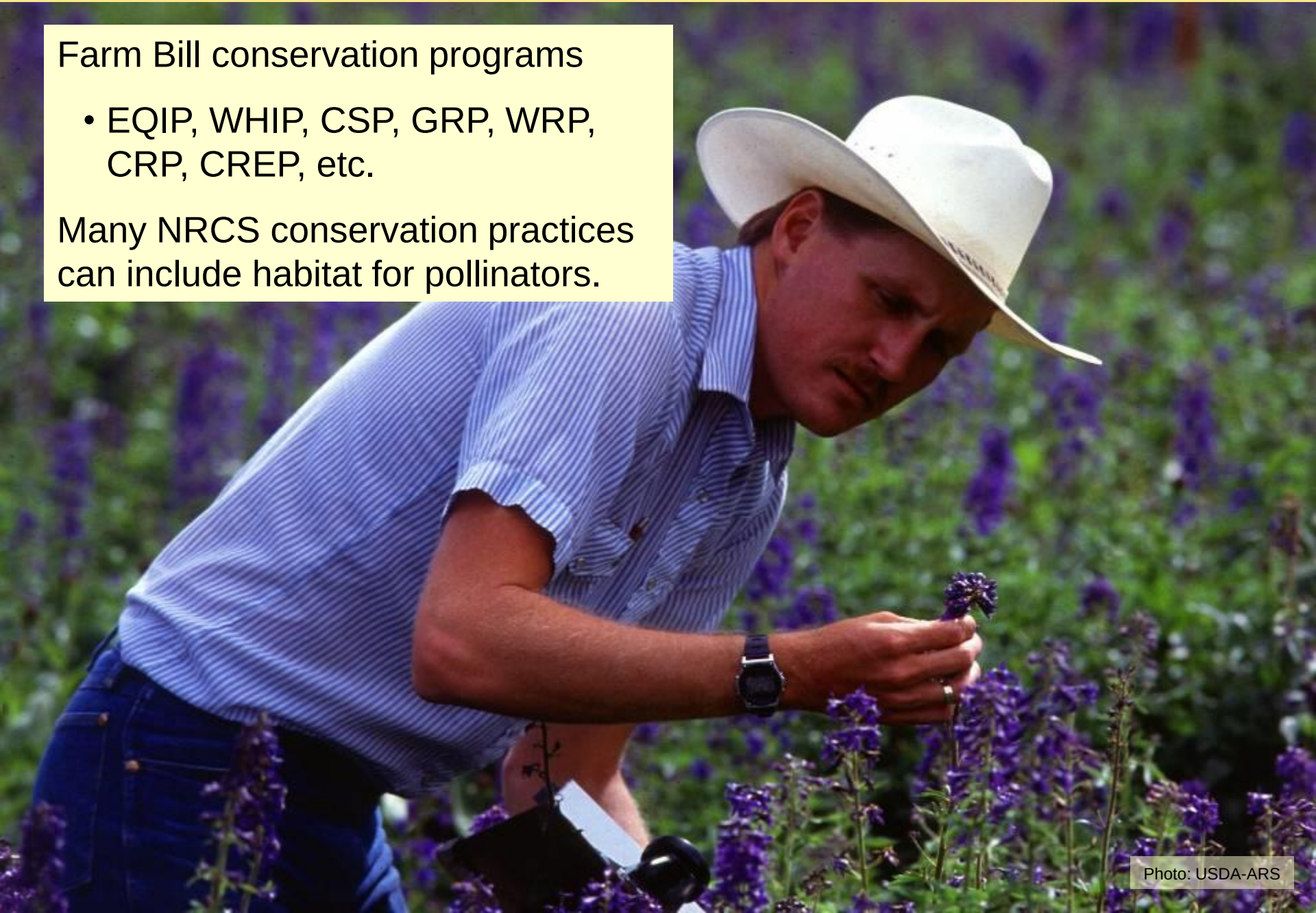
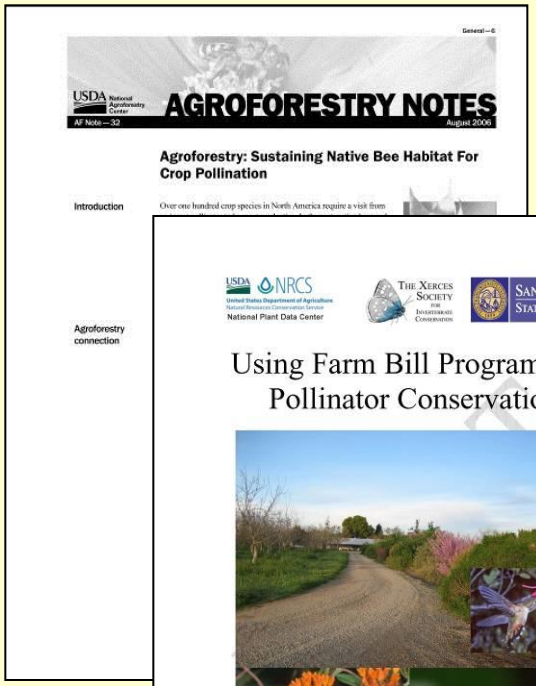
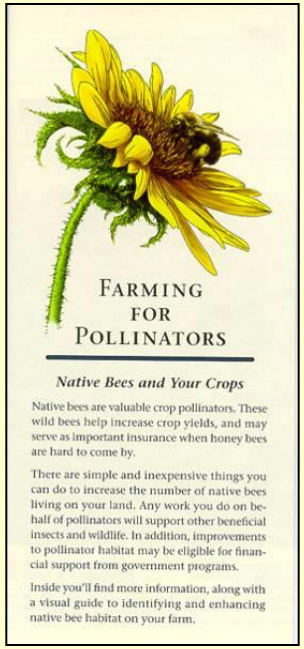


Photo: USDA-ARS

Further Information: NRCS

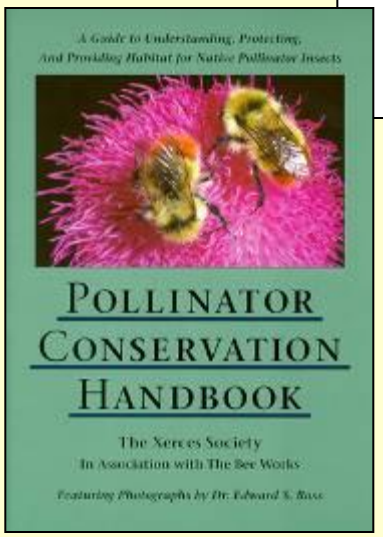
- *Using Farm Bill Programs for Pollinator Conservation*
- *Farming for Pollinators* brochure
- Agroforestry Notes
- PLANTS database

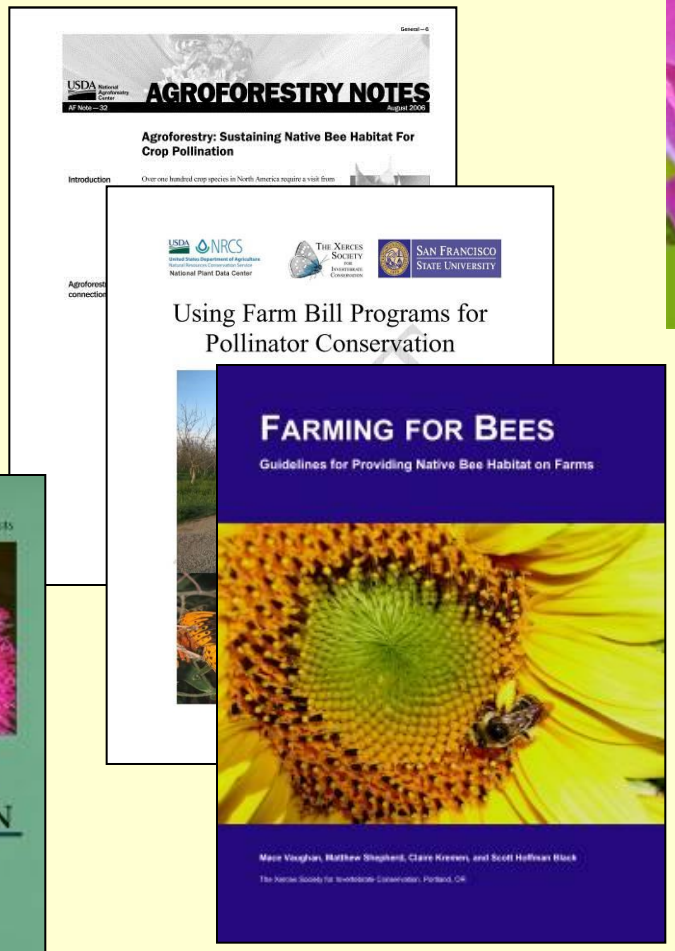




Further Information: Xerces Society

- Xerces Society publications
- www.xerces.org
- (503) 232-6639





Take Home Message

A diverse community of wild native bees can provide significant pollination for many crops.

Habitat can support wild pollinators as well as managed native and honey bees:

- plant forage patches
- create nest sites
- minimize pesticide risk

Farm Bill conservation programs can be used to support the conservation of pollinators.

Photo: Mace Vaughan

www.xerces.org
(follow links to pollinator program)

Thanks

Thanks to the Xerces Society Pollinator Conservation Program and the NRCS West National Technology Support Center for help in developing this presentation.

www.xerces.org
(follow links to pollinator program)

Photo: Mace Vaughan

THE END

The Xerces Society Agricultural Pollinator Program

Mission: Support the sustainability and profitability of farms, while conserving habitat for pollinators and wildlife.